

Noise in Negative Resistance Devices

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From the fluctuations, or *noise*, in the current through an electronic device one can learn about the microscopic motion of the electrons, beyond what the current alone can tell us.

We have found that in two kinds of *tunnel diodes* used as high-frequency oscillators, the dependence of the current on the voltage applied is almost identical. However, their noise characteristics are completely different. Whereas in one of them the noise is independent of voltage, and equal to that found in a vacuum tube, in the other device the noise is smaller at certain voltage regions and larger in others.

We have shown that the different behavior of these devices has to do with whether the electrons flow smoothly and evenly spaced through the device, or whether their motion is correlated, either courting or avoiding each other.

Thanks to this work, in the future it will be possible to find out how electrons travel from one place to another in nanoconductors such as molecules – simply by measuring their electric noise characteristics and comparing them with those found in these tunnel diodes.

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